CLAIMS

1. A method of cleaning a ruthenium-containing deposit from a surface of a ruthenium-deposition apparatus or inhibiting formation of a ruthenium-containing deposit on a surface of a ruthenium-deposition apparatus, comprising:

providing carbon monoxide (CO) gas proximate to a surface of a ruthenium-deposition apparatus.

2. A method as in claim 1 wherein said providing carbon monoxide gas comprises flowing carbon monoxide gas through said ruthenium-deposition apparatus.

3. A method as in claim 1 wherein said providing carbon monoxide gas comprises purging said ruthenium-deposition apparatus with carbon monoxide gas.

4. A method as in claim 1 wherein said providing carbon monoxide gas comprises mixing carbon monoxide gas with a ruthenium precursor gas in said ruthenium-deposition apparatus.

5. A method as in claim 1 wherein said providing carbon monoxide gas comprises mixing carbon monoxide gas with ruthenium precursor gas before injecting said ruthenium precursor gas into a ruthenium-deposition reaction chamber.

6. A method as in claim 1 wherein said providing carbon monoxide gas comprises flowing carbon monoxide gas through reaction chamber inlet tubing.

7. A method as in claim 1 wherein said providing carbon monoxide gas comprises flowing carbon monoxide gas through a gas inlet nozzle into a ruthenium-deposition reaction chamber.

8. A method as in claim 1 wherein said providing carbon monoxide gas comprises flowing carbon monoxide gas into a ruthenium-deposition reaction chamber proximate to a substrate holder.

9. A method as in claim 1, further comprising maintaining a temperature of said surface of said ruthenium-deposition apparatus in a range of about from 150°C to 250°C.

10. A method of fabricating a ruthenium-containing thin film on an integrated circuit substrate, comprising:

inserting a substrate into a ruthenium-deposition reaction chamber;

injecting a vaporized ruthenium precursor into said reaction chamber; and

injecting carbon monoxide (CO) gas into said reaction chamber;

then removing said substrate from said ruthenium-deposition reaction chamber.

11. A method as in claim 10, further comprising substantially ceasing injecting vaporized ruthenium precursor before said injecting carbon monoxide (CO) gas into said ruthenium-deposition reaction chamber.

12. A method as in claim 10 wherein said injecting carbon monoxide (CO) gas into said ruthenium-deposition reaction chamber includes substantially purging said vaporized ruthenium precursor from said reaction chamber with said carbon monoxide (CO) gas.

13. A method as in claim 10 wherein said injecting carbon monoxide (CO) gas into said ruthenium-deposition reaction chamber is conducted concurrently with said injecting said vaporized ruthenium precursor into said reaction chamber.

14. A method as in claim 10 wherein said injecting a vaporized ruthenium precursor comprises continuously flowing said vaporized ruthenium precursor through said ruthenium-deposition reaction chamber.

15. A method as in claim 10 wherein said injecting carbon monoxide (CO) gas comprises continuously flowing carbon monoxide (CO) gas through said ruthenium-deposition reaction chamber.

16. A method as in claim 10, further comprising conducting an inter-wafer purge by flowing carbon monoxide (CO) gas through said ruthenium-deposition reaction chamber after said removing said substrate.

17. A method of fabricating a ruthenium-containing thin film on an integrated circuit substrate, comprising:

inserting a substrate into a ruthenium-ALD reaction chamber;

injecting a vaporized ruthenium precursor into said ruthenium-ALD reaction chamber during a Ru-dosing stage;

then injecting carbon monoxide (CO) gas into said ruthenium-ALD reaction chamber to purge said ruthenium precursor from said ruthenium-ALD reaction

chamber;

then injecting a surface-reactivation gas into said ruthenium-ALD reaction chamber during a surface reactivation stage; and

then injecting carbon monoxide (CO) gas into said ruthenium-ALD reaction chamber to purge said surface-reactivation gas from said ruthenium-ALD reaction chamber.

18. A method as in claim 17, further comprising mixing carbon monoxide (CO) gas with said vaporized ruthenium precursor before said injecting said ruthenium precursor into said ruthenium-ALD reaction chamber.

19. A method as in claim 17, further comprising flowing carbon monoxide (CO) purge gas into said ruthenium-ALD reaction chamber at selected locations during said Ru-dosing stage.

20. A method as in claim 17, further comprising flowing carbon monoxide (CO) purge gas into said ruthenium-ALD reaction chamber at selected locations during said surface-reactivation stage.